SEQUENCE LISTING

<110> Jones, Marcus B.
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<120> B. ANTHRACIS PREVENTION AND TREATMENT: MUTANT B. ANTHRACIS LACKING LUXS ACTIVITY AND FURANONE INHIBITION OF GROWTH, AI-2 QUORUM SENSING, AND TOXIN PRODUCTION

<130> 05986/100M724-US1

<150> US 60/462,254
<151> 2003-04-11

<150> US 60/462,255
<151> 2003-04-11

<160> 20

<170> PatentIn version 3.1

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<212> DNA
<213> Bacillus anthracis

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tgccaaccga ataaacaagc aatgaaacca gatgttattc atacgttaga acatttatta 180

gcatttaatt tacgtaaata tattgatcgt tatccacatt ttgatattat cgatatttca 240

ccaatgggct gccaaacagg atactacctt gtagtaagcg gaacaccgac agttcgagaa 300

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gcaaatgaaa cacaatgtgg tcaagcgaag cttcacgatt tagaaggagc aaaacgctta 420

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<210> 2
<211> 157
<212> PRT
<213> Bacillus anthracis

<400> 2

Met Pro Ser Val Glu Ser Phe Glu Leu Asp His Thr Ile Val Lys Ala
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Pro Tyr Val Arg His Cys Gly Val His Asn Val Gly Ser Asp Gly Ile
20 25 30

Val Asn Lys Phe Asp Ile Arg Phe Cys Gln Pro Asn Lys Gln Ala Met
35 40 45

Lys Pro Asp Val Ile His Thr Leu Glu His Leu Leu Ala Phe Asn Leu
50 55 60

Arg Lys Tyr Ile Asp Arg Tyr Pro His Phe Asp Ile Ile Asp Ile Ser
65 70 75 80

Pro Met Gly Cys Gln Thr Gly Tyr Tyr Leu Val Val Ser Gly Thr Pro
85 90 95

Thr Val Arg Glu Ile Ile Asp Leu Leu Glu Leu Thr Leu Lys Asp Ala
100 105 110

Val Gln Ile Thr Glu Ile Pro Ala Ala Asn Glu Thr Gln Cys Gly Gln
115 120 125

Ala Lys Leu His Asp Leu Glu Gly Ala Lys Arg Leu Met Asn Phe Trp
130 135 140

Leu Ser Gln Asp Lys Asp Glu Leu Glu Lys Val Phe Gly
145 150 155

<210> 3
<211> 171
<212> PRT
<213> Escherichia coli

<400> 3

Met Pro Leu Leu Asp Ser Phe Thr Val Asp His Thr Arg Met Glu Ala
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Pro Ala Val Arg Val Ala Lys Thr Met Asn Thr Pro His Gly Asp Ala
20 25 30

Ile Thr Val Phe Asp Leu Arg Phe Cys Val Pro Asn Lys Glu Val Met
35 40 45

Pro Glu Arg Gly Ile His Thr Leu Glu His Leu Phe Ala Gly Phe Met
50 55 60

Arg Asn His Leu Asn Gly Asn Gly Val Glu Ile Ile Asp Ile Ser Pro
65 70 75 80

Met Gly Cys Arg Thr Gly Phe Tyr Met Ser Leu Ile Gly Thr Pro Asp
85 90 95

Glu Gln Arg Val Ala Asp Val Trp Lys Ala Ala Met Glu Asp Val Leu
100 105 110

Lys Val Gln Asp Gln Asn Gln Ile Pro Glu Leu Asn Val Tyr Gln Cys
115 120 125

Gly Thr Tyr Gln Met His Ser Leu Gln Glu Ala Gln Asp Ile Ala Arg
130 135 140

Ser Ile Leu Glu Arg Asp Val Arg Ile Asn Ser Asn Glu Glu Leu Ala
145 150 155 160

Leu Pro Lys Glu Lys Leu Gln Glu Leu His Ile
165 170

<210> 4
<211> 172
<212> PRT
<213> Vibrio harveyi

<400> 4

Met Pro Leu Leu Asp Ser Phe Thr Val Asp His Thr Arg Met Asn Ala
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Pro Ala Val Arg Val Ala Lys Thr Met Gln Thr Pro Lys Gly Asp Thr
20 25 30

Ile Thr Val Phe Asp Leu Arg Phe Thr Ala Pro Asn Lys Asp Ile Leu
35 40 45

Ser Glu Lys Gly Ile His Thr Leu Glu His Leu Tyr Ala Gly Phe Met
50 55 60

Arg Asn His Leu Asn Gly Asp Ser Val Glu Ile Ile Asp Ile Ser Pro
65 70 75 80

Met Gly Cys Arg Thr Gly Phe Tyr Met Ser Leu Ile Gly Thr Pro Ser
85 90 95

Glu Gln Gln Val Ala Asp Ala Trp Ile Ala Ala Met Glu Asp Val Leu
100 105 110

Lys Val Glu Asn Gln Asn Lys Ile Pro Glu Leu Asn Glu Tyr Gln Cys
115 120 125

Gly Thr Ala Ala Met His Ser Leu Asp Glu Ala Lys Gln Ile Ala Lys
130 135 140

Asn Ile Leu Glu Val Gly Val Ala Val Asn Lys Asn Asp Glu Leu Ala
145 150 155 160

Leu Pro Glu Ser Met Leu Arg Glu Leu Arg Ile Asp

165 170

<210> 5
<211> 172
<212> PRT
<213> Vibrio cholerae

<400> 5

Met Pro Leu Leu Asp Ser Phe Thr Val Asp His Thr Arg Met Asn Ala
1 5 10 15

Pro Ala Val Arg Val Ala Lys Thr Met Gln Thr Pro Lys Gly Asp Thr
20 25 30

Ile Thr Val Phe Asp Leu Arg Phe Thr Met Pro Asn Lys Asp Ile Leu
35 40 45

Ser Glu Arg Gly Ile His Thr Leu Glu His Leu Tyr Ala Gly Phe Met
50 55 60

Arg Asn His Leu Asn Gly Ser Gln Val Glu Ile Ile Asp Ile Ser Pro
65 70 75 80

Met Gly Cys Arg Thr Gly Phe Tyr Met Ser Leu Ile Gly Ala Pro Thr
85 90 95

Glu Gln Gln Val Ala Gln Ala Trp Leu Ala Ala Met Gln Asp Val Leu
100 105 110

Lys Val Glu Ser Gln Glu Gln Ile Pro Glu Leu Asn Glu Tyr Gln Cys
115 120 125

Gly Thr Ala Ala Met His Ser Leu Glu Glu Ala Lys Ala Ile Ala Lys
130 135 140

Asn Val Ile Ala Ala Gly Ile Ser Val Asn Arg Asn Asp Glu Leu Ala
145 150 155 160

Leu Pro Glu Ser Met Leu Asn Glu Leu Lys Val His
165 170

<210> 6
<211> 171
<212> PRT
<213> Yersinia pestis

<400> 6

Met Pro Leu Leu Asp Ser Phe Thr Val Asp His Thr Ile Met Lys Ala
1 5 10 15

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Pro Ala Val Arg Val Ala Lys Thr Met Lys Thr Pro His Gly Asp Glu
            20                  25                  30

Ile Thr Val Phe Asp Leu Arg Phe Cys Val Pro Asn Lys Glu Val Met
        35                  40                  45

Pro Glu Lys Gly Ile His Thr Leu Glu His Leu Phe Ala Gly Phe Met
    50                  55                  60

Arg Asp His Leu Asn Gly Asp Gly Val Glu Ile Ile Asp Ile Ser Pro
65                  70                  75                  80

Met Gly Cys Arg Thr Gly Phe Tyr Met Ser Leu Ile Gly Thr Pro Asp
                85                  90                  95

Glu Gln Arg Val Ala Asp Ala Trp Lys Ala Ala Met Ala Asp Val Leu
            100                 105                 110

Lys Val Thr Asp Gln Arg Lys Ile Pro Glu Leu Asn Glu Tyr Gln Cys
        115                 120                 125

Gly Thr Tyr His Met His Ser Leu Glu Glu Ala Gln Ser Ile Ala Lys
    130                 135                 140

Asp Ile Leu Asp Arg Asp Val Arg Ile Asn His Asn Glu Glu Leu Ala
145                 150                 155                 160

Leu Pro Lys Glu Lys Leu Thr Glu Leu His Ile
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<211> 167
<212> PRT
<213> Haemophilus influenzae

<400> 7

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Met Pro Leu Leu Asp Ser Phe Lys Val Asp His Thr Lys Met Asn Ala
1               5                   10                  15

Pro Ala Val Arg Ile Ala Lys Thr Met Leu Thr Pro Lys Gly Asp Asn
            20                  25                  30

Ile Thr Val Phe Asp Leu Arg Phe Cys Ile Pro Asn Lys Glu Ile Leu
        35                  40                  45

Ser Pro Lys Gly Ile His Thr Leu Glu His Leu Phe Ala Gly Phe Met
    50                  55                  60
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Arg Asp His Leu Asn Gly Asp Ser Ile Glu Ile Ile Asp Ile Ser Pro
65 70 75 80

Met Gly Cys Arg Thr Gly Phe Tyr Met Ser Leu Ile Gly Thr Pro Asn
85 90 95

Glu Gln Lys Val Ser Glu Ala Trp Leu Ala Ser Met Gln Asp Val Leu
100 105 110

Gly Val Gln Asp Gln Ala Ser Ile Pro Glu Leu Asn Ile Tyr Gln Cys
115 120 125

Gly Ser Tyr Thr Glu His Ser Leu Glu Asp Ala His Glu Ile Ala Lys
130 135 140

Asn Val Ile Ala Arg Gly Ile Gly Val Asn Lys Asn Glu Asp Leu Ser
145 150 155 160

Leu Asp Asn Ser Leu Leu Lys
165

<210> 8
<211> 168
<212> PRT
<213> Neisseria meningitidis

<400> 8

Met Pro Leu Leu Asp Ser Phe Lys Val Asp His Thr Arg Met His Ala
1 5 10 15

Pro Ala Val Arg Val Ala Lys Thr Met Thr Thr Pro Lys Gly Asp Thr
20 25 30

Ile Thr Val Phe Asp Leu Arg Phe Cys Val Pro Asn Lys Glu Ile Leu
35 40 45

Pro Glu Lys Gly Ile His Thr Leu Glu His Leu Phe Ala Gly Phe Met
50 55 60

Arg Asp His Leu Asn Gly Asn Gly Val Glu Ile Ile Asp Ile Ser Pro
65 70 75 80

Met Gly Cys Arg Thr Gly Phe Tyr Met Ser Leu Ile Gly Thr Pro Ser
85 90 95

Glu Gln Gln Val Ala Asp Ala Trp Leu Ala Ser Met Gln Asp Val Leu
100 105 110

Asn Val Lys Asp Gln Ser Lys Ile Pro Glu Leu Asn Glu Tyr Gln Cys

115 120 125

Gly Thr Tyr Gln Met His Ser Leu Ala Glu Ala Gln Gln Ile Ala Gln
130 135 140

Asn Val Leu Ala Arg Lys Val Ala Val Asn Lys Asn Glu Glu Leu Thr
145 150 155 160

Leu Asp Glu Gly Leu Leu Asn Ala
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<210> 9
<211> 164
<212> PRT
<213> Campylobacter jejuni

<400> 9

Met Pro Leu Leu Asp Ser Phe Lys Val Asp His Thr Lys Met Pro Ala
1 5 10 15

Pro Ala Val Arg Leu Ala Lys Val Met Lys Thr Pro Lys Gly Asp Asp
20 25 30

Ile Ser Val Phe Asp Leu Arg Phe Cys Ile Pro Asn Lys Asp Ile Met
35 40 45

Ser Glu Lys Gly Thr His Thr Leu Glu His Leu Phe Ala Gly Phe Met
50 55 60

Arg Asp His Leu Asn Ser Asn Ser Val Glu Ile Ile Asp Ile Ser Pro
65 70 75 80

Met Gly Cys Arg Thr Gly Phe Tyr Met Ser Leu Ile Gly Thr Pro Asp
85 90 95

Glu Lys Ser Ile Ala Lys Ala Trp Glu Ala Ala Met Lys Asp Val Leu
100 105 110

Ser Val Ser Asp Gln Ser Lys Ile Pro Glu Leu Asn Ile Tyr Gln Cys
115 120 125

Gly Thr Cys Ala Met His Ser Leu Asp Glu Ala Lys Gln Ile Ala Gln
130 135 140

Lys Val Leu Asn Leu Gly Ile Ser Ile Ile Asn Asn Lys Glu Leu Lys
145 150 155 160

Leu Glu Asn Ala

<210> 10
<211> 152
<212> PRT
<213> E. faecalis

<400> 10

Met Ala Arg Val Glu Ser Phe Glu Leu Asp His Asn Thr Val Lys Ala
1 5 10 15

Pro Tyr Val Arg Leu Ala Gly Thr Glu Gln Asn Gly Asp Ala Leu Val
20 25 30

Glu Lys Tyr Asp Leu Arg Phe Leu Gln Pro Asn Lys Asp Ala Leu Pro
35 40 45

Thr Gly Ala Leu His Thr Leu Glu His Leu Leu Ala Val Asn Met Arg
50 55 60

Asp Glu Leu Lys Gly Ile Ile Asp Ile Ser Pro Met Gly Cys Arg Thr
65 70 75 80

Gly Phe Tyr Met Ile Met Trp Asp Gln His Ser Pro Gln Glu Ile Arg
85 90 95

Asp Ala Leu Val Asn Val Leu Asn Lys Val Ile Asn Thr Glu Val Val
100 105 110

Pro Ala Val Ser Ala Lys Glu Cys Gly Asn Tyr Lys Asp His Ser Leu
115 120 125

Phe Ala Ala Lys Glu Tyr Ala Lys Ile Val Leu Asp Gln Gly Ile Ser
130 135 140

Leu Asp Pro Phe Glu Arg Ile Leu
145 150

<210> 11
<211> 156
<212> PRT
<213> Staphylococcus aureus

<400> 11

Met Thr Lys Met Asn Val Glu Ser Phe Asn Leu Asp His Thr Lys Val
1 5 10 15

Val Ala Pro Phe Ile Arg Leu Ala Gly Thr Met Glu Gly Leu Asn Gly
20 25 30

Asp Val Ile His Lys Tyr Asp Ile Arg Phe Lys Gln Pro Asn Lys Glu
35 40 45

His Met Asp Met Pro Gly Leu His Ser Leu Glu His Leu Met Ala Glu
50 55 60

Asn Ile Arg Asn His Ser Asp Lys Val Val Asp Leu Ser Pro Met Gly
65 70 75 80

Cys Gln Thr Gly Phe Tyr Val Ser Phe Ile Asn His Asp Asn Tyr Asp
85 90 95

Asp Val Leu Asn Ile Val Glu Ala Thr Leu Asn Asp Val Leu Asn Ala
100 105 110

Thr Glu Val Pro Ala Cys Asn Glu Val Gln Cys Gly Trp Ala Ala Ser
115 120 125

His Ser Leu Glu Gly Ala Lys Thr Ile Ala Gln Ala Phe Leu Asp Lys
130 135 140

Arg Asn Glu Trp His Asp Val Phe Gly Thr Gly Lys
145 150 155

<210> 12
<211> 155
<212> PRT
<213> Helicobacter pylori

<400> 12

Met Lys Thr Pro Lys Met Asn Val Glu Ser Phe Asn Leu Asp His Thr
1 5 10 15

Lys Val Lys Ala Pro Tyr Val Arg Val Ala Asp Arg Lys Lys Gly Val
20 25 30

Asn Gly Asp Leu Ile Val Lys Tyr Asp Val Arg Phe Lys Gln Pro Asn
35 40 45

Gln Asp His Met Asp Met Pro Ser Leu His Ser Leu Glu His Leu Val
50 55 60

Ala Glu Ile Ile Arg Asn His Ala Ser Tyr Val Val Asp Trp Ser Pro
65 70 75 80

Met Gly Cys Gln Thr Gly Phe Tyr Leu Thr Val Leu Asn His Asp Asn
85 90 95

Tyr Thr Glu Ile Leu Glu Val Leu Glu Lys Thr Met Gln Asp Val Leu

100 105 110

Lys Ala Thr Glu Val Pro Ala Ser Asn Glu Lys Gln Cys Gly Trp Ala
115 120 125

Ala Asn His Thr Leu Glu Gly Ala Lys Asp Leu Ala Arg Ala Phe Leu
130 135 140

Asp Lys Arg Ala Glu Trp Ser Glu Val Gly Val
145 150 155

<210> 13
<211> 157
<212> PRT
<213> Bacillus subtilis

<400> 13

Met Pro Ser Val Glu Ser Phe Glu Leu Asp His Asn Ala Val Val Ala
1 5 10 15

Pro Tyr Val Arg His Cys Gly Val His Lys Val Gly Thr Asp Gly Val
20 25 30

Val Asn Lys Phe Asp Ile Arg Phe Cys Gln Pro Asn Lys Gln Ala Met
35 40 45

Lys Pro Asp Thr Ile His Thr Leu Glu His Leu Leu Ala Phe Thr Ile
50 55 60

Arg Ser His Ala Glu Lys Tyr Asp His Phe Asp Ile Ile Asp Ile Ser
65 70 75 80

Pro Met Gly Cys Gln Thr Gly Tyr Tyr Leu Val Val Ser Gly Glu Pro
85 90 95

Thr Ser Ala Glu Ile Val Asp Leu Leu Glu Asp Thr Met Lys Glu Ala
100 105 110

Val Glu Ile Thr Glu Ile Pro Ala Ala Asn Glu Lys Gln Cys Gly Gln
115 120 125

Ala Lys Leu His Asp Leu Glu Gly Ala Lys Arg Leu Met Arg Phe Trp
130 135 140

Leu Ser Gln Asp Lys Glu Glu Leu Leu Lys Val Phe Gly
145 150 155

<210> 14
<211> 158

<212> PRT
<213> Bacillus halodurans

<400> 14

Met Pro Thr Val Glu Ser Phe Glu Leu Asp His Thr Ile Val Lys Ala
1 5 10 15

Pro Phe Val Arg Pro Cys Gly Thr His Lys Val Gly Thr Asn Gly Glu
20 25 30

Val Asn Lys Phe Asp Ile Arg Phe Phe Gln Pro Asn Lys Gln Ala Met
35 40 45

Lys Pro Asp Val Ile His Thr Leu Glu His Leu Leu Ala Leu Asn Ile
50 55 60

Arg Lys Phe Ala Glu Ala Tyr Asp His Phe Asp Val Ile Asp Leu Ser
65 70 75 80

Pro Met Gly Cys Gln Thr Gly Phe Tyr Leu Ile Met Ser Gly Lys Pro
85 90 95

Thr Val Glu Glu Ile Ile Asp Val Leu Glu Gln Thr Met Lys Tyr Ser
100 105 110

Leu Glu Leu Glu Glu Val Pro Ala Ala Asn Glu Lys Gln Cys Gly Gln
115 120 125

Ala Lys Leu His Asp Leu Asp Gly Ala Lys Lys Leu Met Thr Tyr Trp
130 135 140

Leu Ser His Glu Lys Asp Ser Leu Thr Lys Val Phe Glu Ser
145 150 155

<210> 15
<211> 155
<212> PRT
<213> Listeria monocytogenes

<400> 15

Met Ala Glu Lys Met Asn Val Glu Ser Phe Asn Leu Asp His Thr Lys
1 5 10 15

Val Lys Ala Pro Phe Val Arg Leu Ala Gly Thr Lys Val Gly Val His
20 25 30

Gly Asp Glu Ile Tyr Lys Tyr Asp Val Arg Phe Lys Gln Pro Asn Lys
35 40 45

Glu His Met Glu Met Pro Ala Leu His Ser Leu Glu His Leu Met Ala
50 55 60

Glu Leu Ala Arg Asn His Thr Asp Lys Leu Val Asp Ile Ser Pro Met
65 70 75 80

Gly Cys Gln Thr Gly Phe Tyr Val Ser Phe Ile Asn His Ser Asp Tyr
85 90 95

Asp Asp Ala Leu Glu Ile Ile Ala Thr Thr Leu Thr Asp Val Leu Val
100 105 110

Ala Thr Glu Val Pro Ala Cys Asn Glu Val Gln Cys Gly Trp Ala Ala
115 120 125

Ser His Ser Leu Glu Gly Ala Lys Ala Leu Ala Glu Glu Phe Leu Ala
130 135 140

Lys Arg Ser Glu Trp Lys Asn Val Phe Gly Glu
145 150 155

<210> 16
<211> 171
<212> PRT
<213> Clostridium botulinum

<400> 16

Met Val Lys Val Glu Ser Phe Ser Leu Asp His Thr Lys Val Lys Ala
1 5 10 15

Pro Phe Val Arg Lys Cys Gly Thr Gln Lys Gly Glu Met Gly Asp Thr
20 25 30

Ile Thr Lys Phe Asp Leu Arg Phe Ser Gln Pro Asn Glu Glu Glu Met
35 40 45

Pro Thr Gly Ala Val His Thr Leu Glu His Leu Leu Ala Gly Tyr Met
50 55 60

Arg Glu Lys Met Asp Asn Ile Ile Asp Ile Ser Pro Met Gly Cys Arg
65 70 75 80

Thr Gly Phe Tyr Leu Ile Ala Trp Gly Glu Val Glu Val Asp Thr Ile
85 90 95

Ile Glu Ala Leu Asn Tyr Ser Leu Asn Lys Val Ile Glu Thr Glu Glu
100 105 110

Val Pro Ala Thr Asn Ala Val Gln Cys Gly Asn Tyr Arg Asp His Ser

115 120 125

Leu Phe Ser Ala Lys Glu Tyr Ala Lys His Val Leu Asn Gln Gly Ile
130 135 140

Ser Asn Glu Val Phe Arg Glx Tyr Gln Arg Ala Tyr Arg Gln Tyr Pro
145 150 155 160

Tyr Ser Lys Thr Glx Gln Phe Lys Tyr Glx Thr
165 170

<210> 17
<211> 160
<212> PRT
<213> Streptococcus pyogenes

<400> 17

Met Thr Lys Glu Val Ile Val Glu Ser Phe Glu Leu Asp His Thr Ile
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Val Lys Ala Pro Tyr Val Arg Leu Ile Ser Glu Glu Phe Gly Pro Lys
20 25 30

Gly Asp Arg Ile Thr Asn Phe Asp Val Arg Leu Val Gln Pro Asn Gln
35 40 45

Asn Ser Ile Glu Thr Ala Gly Leu His Thr Ile Glu His Leu Leu Ala
50 55 60

Lys Leu Ile Arg Gln Arg Ile Asp Gly Met Ile Asp Cys Ser Pro Phe
65 70 75 80

Gly Cys Arg Thr Gly Phe His Leu Ile Met Trp Gly Lys His Ser Ser
85 90 95

Thr Asp Ile Ala Lys Val Ile Lys Ser Ser Leu Glu Glu Ile Ala Thr
100 105 110

Gly Ile Thr Trp Glu Asp Val Pro Gly Thr Thr Leu Glu Ser Cys Gly
115 120 125

Asn Tyr Lys Asp His Ser Leu Phe Ala Ala Lys Glu Trp Ala Gln Leu
130 135 140

Ile Ile Asp Gln Gly Ile Ser Asp Asp Pro Phe Ser Arg His Val Ile
145 150 155 160

<210> 18
<211> 160

<212> PRT
<213> Streptococcus pneumoniae

<400> 18

Met Ser Lys Glu Val Ile Val Glu Ser Phe Glu Leu Asp His Thr Ile
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Val Lys Ala Pro Tyr Val Arg Leu Ile Gly Glu Glu Thr Gly Pro Lys
20 25 30

Gly Asp Ile Ile Ser Asn Tyr Asp Ile Arg Leu Val Gln Pro Asn Glu
35 40 45

Asp Ser Ile Pro Thr Ala Gly Leu His Thr Ile Glu His Leu Leu Ala
50 55 60

Lys Leu Ile Arg Thr Arg Ile Asp Gly Met Ile Asp Cys Ser Pro Phe
65 70 75 80

Gly Cys Arg Thr Gly Phe His Met Ile Met Trp Gly Arg His Thr Ser
85 90 95

Ala Lys Ile Ala Ala Val Ile Lys Asp Ser Leu Lys Glu Ile Ala Glu
100 105 110

Thr Thr Thr Trp Glu Asp Val Pro Gly Thr Thr Ile Glu Ser Cys Gly
115 120 125

Asn Tyr Lys Asp His Ser Leu Phe Ser Ala Lys Glu Trp Ala Lys Leu
130 135 140

Ile Leu Glu Gln Gly Ile Ser Asp Asp Ala Phe Glu Arg His Val Ile
145 150 155 160

<210> 19
<211> 171
<212> PRT
<213> Salmonella typhimurium

<400> 19

Met Pro Leu Leu Asp Ser Phe Ala Val Asp His Thr Arg Met Gln Ala
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Pro Ala Val Arg Val Ala Lys Thr Met Asn Thr Pro His Gly Asp Ala
20 25 30

Ile Thr Val Phe Asp Leu Arg Phe Cys Ile Pro Asn Lys Glu Val Met
35 40 45

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Pro Glu Lys Gly Ile His Thr Leu Glu His Leu Phe Ala Gly Phe Met
    50                  55                  60

Arg Asp His Leu Asn Gly Asn Gly Val Glu Ile Ile Asp Ile Ser Pro
65                  70                  75                  80

Met Gly Cys Arg Thr Gly Phe Tyr Met Ser Leu Ile Gly Thr Pro Asp
                85                  90                  95

Glu Gln Arg Val Ala Asp Ala Trp Lys Ala Ala Met Ala Asp Val Leu
            100                 105                 110

Lys Val Gln Asp Gln Asn Gln Ile Pro Glu Leu Asn Val Tyr Gln Cys
        115                 120                 125

Gly Thr Tyr Gln Met His Ser Leu Ser Glu Ala Gln Asp Ile Ala Arg
    130                 135                 140

His Ile Leu Glu Arg Asp Val Arg Val Asn Ser Asn Lys Glu Leu Ala
145                 150                 155                 160

Leu Pro Lys Glu Lys Leu Gln Glu Leu His Ile
                165                 170
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<210> 20
<211> 471
<212> DNA
<213> Bacillus subtilis

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cattgcggcg tgcataaagt gggaacagac ggcgttgtaa ataaatttga cattcgtttt 120

tgccagccaa ataaacaggc gatgaagcct gacaccattc acacactcga gcatttgctc 180

gcgtttacga ttcgttctca cgctgagaaa tacgatcatt ttgatatcat tgatatttct 240

ccaatgggct gccagacagg ctattatcta gttgtgagcg gagagccgac atcagcggaa 300

atcgttgatc tgcttgaaga cacaatgaag gaagcggtag agattacaga aatacctgct 360

gcgaatgaaa agcagtgcgg ccaagcgaag cttcatgatc tggaaggcgc taaacgttta 420

atgcgtttct ggctttcaca ggataaagaa gaattgctaa aagtatttgg c 471